Riparian Buffer Preparation: Going … Going …

In terms of preparing for the Riparian Buffer station at the fairgrounds, there is both an overriding theme (the ability of vegetative cover to help protect water quality) and a field skill (the use of a simple dichotomous key) to which students should be exposed. Although the "Going … Going … " lesson from *Virginia State Parks: Your Backyard Classrooms* was written specifically for use at Chesapeake Bay region parks, it is easily adaptable to the classroom and schoolyard. In this activity, students demonstrate the forces of weathering and erosion and play a game that introduces them to the filtering action of shoreline or wetland plants.

Perhaps the most applicable training on the tree key that will be used at the field day is to simply print out the key ahead of time and practice using it with trees in the schoolyard, or pictures or drawings.

There are numerous other on-line lessons that introduce students to the concept of dividing items into groups based on shared characteristics. Typically, an introductory level lesson involves using a Venn diagram or other graphic organizer to sort common objects such as toys, buttons, candy or the students themselves. Two- to three-page dichotomous keys are available covering everything from seashells to possible visitors from space. A simple rock classification key is available from Virginia Department of Education on the fifth grade science expanded scope and sequence page. Educators may also want to take a look at:

- "Creature Feature" at http://naturenextdoor.org/PDF%20files/aliendichkey.pdf
- the taxonomy section at www.biologycorner.com/worksheets.html
- www.jason.org/digital_library/3354.aspx
- www.education.com/print/classification
- www.seaworld.org/just-for-teachers/classroom-activities/4-8/pdf/Primate%20dichotomous%20key.pdf

Going...Going...

In this activity, students demonstrate the forces of weathering and erosion and play a game that introduces them to the filtering action of shoreline or wetland plants.

Background

The health of waterways and the quality of drinking water are affected by the connection between land and the water. Rain and wave action erode upland areas along shorelines, sending particles of soil into the water, clouding creeks, rivers, and the bay. This sediment or silt also chokes fish, blocks sunlight needed for growth by underwater plants, and buries and smothers aquatic plants and bottom-dwelling animals.

Although **erosion** is a naturally occurring process, it is often accelerated by human activities on the land. Some practices that expose or loosen soil include construction and other development for housing and roads, conventional tillage for crops, allowing livestock to trample stream banks, and improper lawn care. Any loosened or exposed soil is prone to being washed away.

To slow erosion, these activities must be controlled. Plants help to hold soil in place and to trap soil eroding from other places. **Wetland** plants are especially valuable in filtering soil before it reaches the waterways. On shoreline properties, people often build structures for erosion control. A bulkhead is a wall built to keep waves from carving away the shoreline. Another method is the placement of rocks (called "rip rap") along the shore, which dissipate wave energy while holding the existing shoreline. Planting or maintaining trees and other plants on shoreline as well as upland areas is always a good way to slow the erosion process.

Procedure

Before the Trip:

1. Read the directions, assemble materials, and do a trial run. The amount of water needed to get results will vary depending on tray size, amount and type of soil or sand.

2. Set up stations for students to demonstrate weathering and erosion. Divide the class into groups of four. Each group will do both demonstrations, then will discuss the results as a class.

3. *Demonstration: Tilt It and Spill It.* Start with several shallow pans with soil or sand covering the bottom and a sprinkling can of water (or large paper cup with holes in the bottom). Predict what will happen when the water is sprinkled onto the soil. Restate predictions as a testable hypothesis and record observations. Test the hypothesis and record observations.

- *What do you think will happen if you try this again in another pan, this time tilting one end of the pan up 10" or so?*
- Sprinkle the water on again and record the results.
- *How were the results different?*
- *What landforms can you name that resemble the flat pan and the sloped pan?* (flat = lawn, playing field, etc.; sloped = bank of stream or river, hillside, etc.)
- *What is this process called when it happens in nature?* (Erosion)
- *Why are farmers concerned about erosion?*

Spread the soil evenly again in the pans. Ask the class to develop hypotheses about erosion control mechanisms. Provide the class with materials that might be useful in preventing erosion. Give them five minutes to devise and construct a way to slow erosion. After five minutes, make it rain again and observe how the erosion control devices work.

Grade Levels: 2 - 9

Objectives

Students investigate equilibrium in erosion and deposition by:

- ***predicting* effects of moving water on soil;**
- ***modeling* an erosion simulation;**
- ***observing* results of a test;**
- ***inferring* causes and effects;**
- ***planning* for personal action to save soil;**
- ***hypothesizing* about erosion variables.**

Materials

5 clear jars of similar size

Per group:

- **two shallow, nonbreakable baking-type pans**
- **sand or soil**
- **one watering can with sprinkling spout or cup with holes in the bottom**
- **three clear containers or jars**
- **assorted sticks, stones, small pieces of sod, popsicle sticks, spoons, pieces of plastic, etc.**
- **hand lenses**

Credits

Adapted with permission from *Ranger Rick's NatureScope; Geology, The Active Earth.* 1987' . "Shaping the Landscape," and *The Class Project.* 1982' . National Wildlife Federation, 1400 16th St., N.W., Washington, D.C. 20036-2266.

Where

***Belle Isle:* game can be played on lawn at picnic shelter; erosion can be seen at Watch House site and near picnic shelter.**

***Bush Mill Stream:* no suitable place for game; past erosion can be seen near eastern end of Heron Loop Trail and just west of boardwalk on Deep Landing Trail.**

- *Which method worked the best? Why?*

4. *Demonstration: Soil and Pebble Shakers*. Fill a jar with soil, sand, pebbles, and water; shake well. While shaking the jar, predict which particles will settle to the bottom fastest and which will settle last. *Why?* Set the jar on a flat surface and allow the particles to settle over night. Observe the order of the deposition of layers. Draw and label the layers. Use a hand lens to compare the sizes of the particles in the different layers.

- *Is the water completely clear?*
- *If not, why not?*
- *If these particles were eroding from a stream or river bank, which would cloud the water the most?*
- *Which would travel farthest? Why?*
- *Which size particle would naturally erode faster? Why?*

At the Site:

1. Lead the class to a lawn or field area to play the following game simulating how plants function as sediment traps. Divide the class into two teams: Team 1 will be "plants growing along a shoreline," and Team 2 will be "soil particles."

- The plants form an irregular line at one end of the field, spaced so their outstretched arms do not touch.
- The area behind the plants is designated the waterway.
- The soil particles line up facing the plants and, on a signal, must make their way to the waterway without being touched by a plant. Slow the soil particles by requiring them to drag one foot.
- The plants may bend, stretch, and stoop, but may not move their feet ("roots") in order to tag the soil particles. Soil particles may not go around the end of the plant line.
- When a soil particle is tagged, he or she becomes a plant at that exact spot.
- The game continues until all the particles at the start of the game are caught or escape to the waterway.

2. Repeat the game several times, using student suggestions for modifying the plant spacing to change the results. Keep count of the number of rounds required to complete each game with the modified spacing. Give each student a chance to play both roles.

3. After the game, discuss the roles played and relate the results of the rounds to what actually happens when it rains.

- *Were the plants able to trap more particles in areas where they grew close together?*
- *What happened when there were gaps or bare spots in the line of plants? Relate this to the formation of gullies.*
- *Why are the shoreline or wetland plants important to the water that they border?*

Ask students to suggest some solutions to problems of erosion, based upon the game.

4. Ask students to name some signs of erosion. Take them on a walk to look for these signs. Look for: muddy water in puddles, creeks, streams, or rivers; water running or dripping onto bare ground; bare slopes with paths that seem to have been carved by water; gullies; soil washing away from construction sites or other areas where the ground and plants have been disturbed.

5. At each sign located, ask:

- *Can you tell where the soil went?*
- *Can you find any structures built by humans to control erosion?*
- *Do these devices appear to work?* Find natural materials or situations that help to control erosion.
- *How do these help to slow erosion?*

Follow-up:

1. Students identify at least five locations on the school grounds where they might collect **runoff** after a rain shower.

2. Students predict the relative amounts of sediment that will be suspended in the runoff from each site by ranking the locations.

3. Label jars of similar dimensions with the location names and keep them ready for a rainy day.

4. When it rains, fill the jars with runoff from each location.

5. Students observe and rank the jars according to the clarity of the water, after shaking them.

6. Students compare the results with their predictions and discuss:

- *Does any sediment settle out?*
- *Are all the samples the same?*
- *Is it possible to determine the source of this sediment?*
- *What are some ways to control the erosion or keep the sediment out of the nearest waterway?*

7. Students do an erosion inspection around their homes. Discuss options for improving problem areas.

Caledon: **several fields near visitor center are ideal for game; signs of erosion near visitor center, along park driveways and trails.**
Chippokes: **field between visitor center and pool ideal for game; signs of erosion and erosion control methods along beach and agricultural areas.**
False Cape: **game can be played at Wash Woods or beach; erosion seen around bulkheads at Wash Woods and along dunes at beach.**
First Landing: **lawn between office and amphitheater or beach are best locations for game; erosion along trails and along Broad Bay shore near 64th St. boat ramp.**
Kiptopeke: **game can be played in picnic area or on beach; signs of erosion along northern shore.**
Leesylvania: **open places near picnic area or Freestone Point beach ideal for game; signs of erosion along beach, Lee's Woods Trail, and Bushey Point Trail.**
Mason Neck: **lawn near picnic area suitable for game; erosion along most of park shoreline.**
Westmoreland: **field in front of visitor center ideal for game; erosion visible along trails and shoreline bluffs.**
York River: **field near visitor center ideal for game; erosion and protective value of wetlands evident along shoreline.**

When

Any time of year.

Time Required

At the Site: **Allow 20-30 min. for the game, and up to an hour to take the walk.**

Resources

Chase, V. 1989. "The Force of Moving Water." ***The Changing Chesapeake.*** **National Aquarium in Baltimore. Pier 3, 501 East Pratt St., Baltimore, MD 21202. (410)576-3870. $3.50.**